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INTRODUCTION.

This REVIEW is based on reports for March, 1892, from 2,734 regular and voluntary observers. These reports are classified as follows: 158 reports from Weather Bureau stations; 51 reports from United States Army post surgeons; 1,755 monthly reports from state weather service and voluntary observers; 31 reports from Canadian stations; 217 reports through the Cen-

tral Pacific Railway Company; 522 marine reports through the co-operation of the Hydrographic Office, Navy Department; marine reports through the "New York Herald Weather Service;" monthly reports from local weather services established in all states and territories, except Idaho, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

CHARACTERISTICS OF THE WEATHER FOR MARCH, 1892.

The weather was unusually cool in the east-central, southern, and southwestern states. From the Pacific coast north of the 40th parallel to North Dakota and thence over the northern lake region and Saint Lawrence Valley the month was warmer than usual. On the 11th and 12th cold and frost injured vegetation in the Gulf and south Atlantic states. From the 17th to 19th low temperature and frost seriously injured crops and early vegetation from the southeastern slope of the Rocky Mountains over the Gulf and south Atlantic states and the northern half of the Florida Peninsula. The close of the month was marked by cool weather and frost in parts of Arizona and eastern and southern California.

PRECIPITATION.

The monthly precipitation was irregularly distributed. It was largely in excess of the normal in the interior of the east Gulf states and in Kansas, where, in localities, about double the usual amount of rain fell. There was also a marked excess in Nova Scotia and on the extreme north Pacific coast. The greatest deficiency was noted in Louisiana and Arkansas, eastern Tennessee, central Indiana, and at Portland, Oregon, where about one-half of the normal amount of precipitation was reported.

The monthly snowfall was greater than usual along the New England coast. In central and southwestern Tennessee the heaviest snowstorm on record occurred on the 16th and 17th, the depth of snowfall varying from 7 to 25 inches. This snow was beneficial, as it protected wheat, oats, and clover from the severe cold of that period. Over a great part of the Ohio Valley the snowfall was insufficient to afford protection to grain.

During the months of January, February, and March the precipitation continued in excess of the normal amount generally in the middle Atlantic and east Gulf states, the Missouri Valley, on the northeast slope of the Rocky Mountains, and over the southern plateau region. The precipitation continued deficient during that period at Key West, Fla., in the west Gulf states, the Ohio Valley and Tennessee, the lower lake region, and along the middle and north Pacific coasts.

STORMS.

Severe gales prevailed from Maine to North Carolina from the 1st to 4th, with heavy snow in New York and New England. On the 8th and 9th a heavy windstorm extended from the Dakotas to the lower Missouri valley and the western lake region, and reached the Atlantic coast on the 10th, with local storms from the District of Columbia and Maryland to New England on the 11th. From the 15th to 17th a severe sleet and snow storm prevailed in the Southwest. This storm extended over the middle Atlantic and New England states by the 18th. On the 26th severe local storms occurred from Kansas over the Ohio Valley. On the 31st heavy gales and destructive local storms occurred from Nebraska and Iowa to central Texas. Tornadoes were reported at points in south-central Nebraska, central Kansas, and central Texas. The loss of human life by tornadoes is placed at 36, 34 of which number were killed in Kansas and 2 in Texas, and the estimated value of property destroyed in Kansas was \$150,000, and in Texas \$12,000.

NAVIGATION.

Navigation was partially resumed on Lakes Ontario, Erie, and Michigan, and the upper Mississippi river.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for March, 1892, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on Chart II by isobars.

The normal pressure for March is highest in the Great Salt Lake region, Utah, where it is 30.10, and is lowest over New York, New England, and on the extreme north Pacific coast, where it is below 30.00.

In March the pressure usually decreases over the United States and Canada, the decrease being most marked along the New England coast, over the Canadian Maritime Provinces, and in the Saskatchewan Valley, where it is more than .10.

In March, 1892, the mean pressure was highest in the Red River of the North Valley, where it was above 30.15, and the mean readings were above 30.10 over the east Gulf states, Georgia, and Florida. The mean pressure was lowest at sta-

tions in eastern Nova Scotia and eastern New Brunswick, where it was below 29.80. In a well-defined area of low pressure which occupied the western part of the southern plateau region and in British Columbia and Alberta the mean values were below 29.95.

Chart IV shows that four of the more important areas of high pressure occupied the lower Saskatchewan valley, Manitoba, and the Dakotas during the second decade of the month, and Chart I shows that at least three areas of low pressure of marked severity traversed the region of lowest mean pressure.

A comparison of the pressure chart for March with that of the preceding month shows a decrease of pressure over the entire country, save on the north California coast, where the mean pressure was the same as for the preceding month. The most marked decrease occurred over eastern New Brunswick, where it was more than .30; over the plateau regions it was more than .10; and in the central valleys, over the Gulf States, and along the Pacific coast south of the 45th parallel the mean values were .01 to .05 lower than for February.

The mean pressure was above the normal in the Lake region, the central valleys, and the Atlantic coast states south of New England, the greatest departure above the normal being noted in the extreme upper Mississippi valley and over the Lake region, where it exceeded .05. West of the 105th meridian, and over New England and the Canadian Maritime Provinces the mean pressure was below the normal, the greatest departure appearing in the extreme northeast, on the northeast slope of the Rocky Mountains, and along the middle and south Pacific coasts, where it was more than .05.

HIGH AND LOW AREAS.

The paths of areas of high and low pressure over the United States and Canada during March, 1892, are shown on Charts IV and I, respectively, and some of the prominent characteristics of the areas are given in the table at the end of this chapter.

HIGH AREAS.

Seven high areas appeared, the average number traced for March during the last 18 years being 9. Of the high areas traced for the current month 4 advanced from the British Northwest Territory, one was central north of the Lake region at the opening of the month, one first appeared on the middle-eastern slope of the Rocky Mountains, and one moved eastward from the middle Pacific coast. The high area north of the Lake region on the 1st was a continuation of high area X for February, 1892, and passed eastward to the Gulf of Saint Lawrence. Of the 4 high areas from the British Northwest Territory, 2 moved southward to the west Gulf states and thence eastward to the south Atlantic coast, one disappeared over Manitoba, and one advanced over the Lake region to the middle Atlantic coast and passed thence northeastward. The high area which appeared on the middle-eastern slope of the Rocky Mountains moved eastward to the middle Atlantic coast. The high area from the Pacific coast crossed the continent at an average velocity of 27 miles per hour, and at the close of the month was central southeast of New England. The following is a description of the high areas referred to:

I.—The month opened with this high area central north of the Lake region, with pressure above 30.60, and a low area, number I, on the middle Atlantic coast. Moving eastward the high area reached the Gulf of Saint Lawrence, attended on the 1st by a temperature fall of 20° to 30° in the lower Saint Lawrence valley. The pressure continued high over the Gulf of Saint Lawrence until the 4th, after which the high area moved slowly eastward to mid-ocean by the 6th. During the first six days of the month this high area was a barrier to the advance of low area I.

II.—Appeared north of Montana the morning of the 9th, with pressure above 30.60, passed southward to Texas by the morning of the 11th, and moved thence eastward off the south Atlantic coast during the 12th. The advance of this high area

was attended by a temperature fall of 20° to 40° in the central valleys and the Lake region, and the temperature fell 20° to 30° in the Atlantic coast states and the Saint Lawrence Valley. On the 11th the temperature fell 10° to 20° in the Gulf States and cold injured fruit and vegetables in the middle and west Gulf states. Light and heavy frost was noted from Louisiana to the south Atlantic coast and Florida the morning of the 12th, light frost occurred as far south as Tampa, Fla., and ice formed at Savannah, Ga.

III and IIIa.—Appeared over Saskatchewan the morning of the 12th, with pressure above 30.50, passed to Manitoba by the evening report, with pressure above 30.60, where it was nearly stationary during the 13th, with pressure rising above 30.90. By the morning of the 14th this high area had been re-enforced from the Northwest and number IIIa was central over Saskatchewan, with pressure above 31.00, a reading of 31.10 being reported at Prince Albert, Saskatchewan. The area remained nearly stationary over Assiniboia during the 15th, with pressure 31.12, the highest reading of the month, at Qu'Appelle at the morning report, after which date it moved southward to southeast Texas by the morning of the 18th, and thence eastward over the Gulf of Mexico during the 19th. This high area was attended from the 17th to 19th by a severe cold wave from the southeast slope of the Rocky Mountains to the south Atlantic coast and Florida. On the 15th the temperature fell 20° to 30° in east-central Texas and northern Louisiana, and the morning of the 16th the temperature was below freezing in Texas north of the 30th parallel. The morning of the 18th the temperature was below freezing along the immediate west Gulf coast, and the morning of the 19th the line of freezing weather extended to the east Gulf coast and northern Florida. This cold wave, with attending frost, caused great damage to fruit and early vegetables in the Southern States, and resulted in a heavy loss of stock on the ranges of Texas.

IV.—Appeared in the Saskatchewan Valley on the 18th, with pressure above 30.60, and moved slowly eastward to the region north of Lake Superior by the morning of the 21st, with pressure above 30.70 on the 19th and 20th, after which it passed rapidly southeastward to the middle Atlantic coast by the morning of the 22d, and thence northeastward to the region south of Nova Scotia by the morning of the 23d. The passage of this high area was unattended by a marked fall in temperature, save in the extreme northwest, where it fell 20° to 25° during the 24 hours preceding the morning report of the 19th.

V.—Appeared on the middle-eastern slope of the Rocky Mountains on the 22d, with pressure above 30.10, whence it advanced to the middle Atlantic coast by the morning of the 25th, with pressure above 30.30 over the upper Ohio valley at the morning report of the 24th. On the 22d the temperature fell 20° to 24° in central Texas, on the 23d a temperature fall of 20° occurred in Arkansas and southern Illinois, and on the 24th the temperature fall was 20° from West Virginia to North Carolina.

VI.—Was central off the Oregon and north California coasts on the 25th, with pressure above 30.40, and advanced thence to western Colorado by the evening of the 26th, with pressure above 30.20. During the 27th the high area appeared to divide, one part passing to the lower Missouri valley and the other to the west part of the Gulf of Mexico. During the 28th the northern branch moved to southern Lake Michigan and thence to the northern Ohio valley, with pressure above 30.30. The morning report of the 29th showed two centers, with pressure above 30.40, one in the upper Ohio valley and the other over the eastern Lake Superior region, and at the evening report of that date the high area was central over Georgian Bay, with pressure above 30.30. Passing eastward to the middle Saint Lawrence valley during the 30th and thence southeastward the high area was central southeast of New England, with pressure above 30.50 at the close of the month. The greatest temperature fall noted in connection with this high area was 20° at Cleveland, Ohio, on the 27th.

LOW AREAS.

The low areas of March advance eastward over the United States at an average velocity of 33 statute miles per hour, a decrease in average velocity of 4 miles per hour as compared with the rate of advance in January and February. The tracks for March are more dispersed than during the winter months. A large proportion of the low areas traced pass from the middle-eastern and northeast slopes of the Rocky Mountains to New England and the Gulf of Mexico, and less-frequented tracks are traced from the Southwest, the Gulf of Mexico, and from off the south Atlantic and Florida coasts. An average of 1.9 low areas per month advance from the north Pacific coast and traverse the continent.

The tracks of 13 low areas are plotted on Chart I for March, 1892, the average number traced for March during the last 19 years being 12. Three of the low areas advanced from the Pacific coast north of the 45th parallel, 4 first appeared north of Montana, 3 apparently advanced from the southern plateau region, one was first located over the Gulf of Mexico, one apparently originated over northern Virginia as a subsidiary development, and one, a continuation of low area IX for February, 1892, was central on the middle Atlantic coast at the opening of the month. Of the low areas that advanced from the north Pacific coast, one disappeared in the extreme northwest and 2 were central over the interior of the country at the close of the month, one in northern Indiana and the other in Kansas. The low areas from the British Northwest Territory moved southeastward to the Lake region or lower Missouri valley, and passed thence eastward. Two of the low areas from the southern plateau region reached the Gulf of Saint Lawrence, and one passed eastward over the Gulf of Mexico. The low area from the Gulf of Mexico moved northeastward and disappeared north of the Gulf of Saint Lawrence.

The average velocity of the low areas, 29 miles per hour, was 4 miles per hour less than the average rate of advance of low areas for March. The slow movement and wide distribution of storm tracks resulted in a succession of storms of marked severity over a great part of the country. A description of these storms is given under "Local storms." In addition to a description of the severe local storms in the Western States the evening and night of March 31st, the general meteorological conditions in that region at the morning and evening report of that date, and the location and direction of movement of tornadoes reported are shown by Charts VI and VII. The following is a description of the low areas of the month:

I.—Was a continuation of low area IX for February, 1892, and the morning of the 1st was central over Delaware Bay, with pressure 29.70. Moving slowly northeastward the center reached Nova Scotia and New Brunswick on the 5th, and passed thence to Newfoundland by the 7th. The advance of this low area was retarded by high area I which occupied the Gulf of Saint Lawrence and the Canadian Maritime Provinces until the 3d. After the 3d the high area moved slowly eastward and reached mid-ocean by the 6th. Forced westward over Nova Scotia and New Brunswick during the 5th, the low area showed lowest pressure, 29.20, at Chatham the evening of that date. From the 1st to 4th heavy gales prevailed along the Atlantic coast from Maine to the Carolinas, with heavy snow from the lower lake region over the middle Atlantic and New England states. Along the New England coast the wind velocity was 50 to 60 miles per hour from the northeast. At Block Island, R. I., a velocity of 77 miles per hour was noted on the 1st, and south of New England the maximum velocity, 54 miles per hour from the northwest, was registered at Kitty Hawk, N. C., on the 2d.

II.—A marked decrease of pressure occurred in the lower Colorado and Gila valleys on the 1st. During the 2d the pressure decreased over California, and at the evening report a cyclonic area was apparently central in the San Joaquin Valley, with rain from the middle plateau and the west part of the southern plateau over California. By the morning of the 3d the pressure had increased over California, and the

disturbance was apparently central in the Gila Valley. The center moved eastward to western Texas by the 4th, and thence to southwestern Missouri by the morning of the 6th. On that date the pressure was high over the Lake region, and heavy rain fell in the middle Gulf states. The center moved southward, and was located near New Orleans the morning of the 7th. Moving northeastward with a marked increase of energy the center reached extreme western Virginia the morning of the 8th, with pressure 29.40, and by the evening report had reached the south New England coast, with pressure 29.30, and rain generally east of the Mississippi River. During the 9th the center advanced to the Gulf of Saint Lawrence, with pressure 29.20, after which it passed north of Newfoundland.

III.—Appeared over Alberta on the 6th and passed thence east-southeast to the Lake region by the 8th, where it dissipated or united with low area II. The passage of this low area was unattended by noteworthy features, the lowest pressure, 29.52, being noted at Marquette, Mich., the morning of the 8th.

IV.—Appeared over Alberta on the 7th, with pressure below 29.70, moved thence to the Lake region by the 9th, and dissipated, or passed rapidly eastward and united with number II, during the 10th. This low area developed great energy during the 8th and 9th. Heavy wind storms prevailed in the Missouri and extreme upper Mississippi valleys and the extreme northwest on the 8th, a maximum velocity of 72 miles per hour from the northwest being noted at Bismarck, N. Dak., and a maximum velocity of 66 miles per hour from the northwest occurred at Huron, S. Dak., on the 9th. From the western Lake Superior region to the lower Missouri valley southwest to northwest gales of 50 to over 60 miles per hour caused considerable damage to property. The lowest pressure, 29.16, was noted at the morning report of the 9th, and the rain area extended from the extreme northwest on the 8th to the Ohio Valley and middle Atlantic and New England coasts by the 9th.

V.—Was apparently a subsidiary development. The morning of the 10th a trough of low pressure extended from Virginia to Michigan and thence to the Gulf of Saint Lawrence. This extensive area of low pressure was caused by low areas II and III, and low area III developed in its southern extremity the morning of the 10th. Moving northeastward this low area showed a rapid increase of energy and pressure falling below 29.10. High winds prevailed from the Ohio Valley to the middle Atlantic and New England coasts. On the 10th thunderstorms occurred in Maryland and the District of Columbia, at Cape Cod, Mass., the night of the 10th, and in New England on the 11th. On the 10th and 11th a heavy snowstorm prevailed in New York.

VI.—Appeared over Alberta on the 10th, with pressure below 29.60, passed thence east-southeast to the eastern Lake region by the morning of the 12th without evidence of marked energy, and moving thence north of east united with low area V in the Gulf of Saint Lawrence region, its passage being unattended by noteworthy features.

VII.—On the 13th the 12-hour decrease of pressure was .10 to .14 over the south part of the southern plateau region, and on the 14th this low area was central near El Paso, Tex., with pressure below 29.80 at the evening report. By the morning of the 15th the center had reached the lower Rio Grande valley, with a marked increase of pressure, after which it apparently moved rapidly eastward over the Gulf of Mexico and disappeared east of Florida by the 16th. During the passage of this low area the central and northern districts were occupied by high area IIIa, which prevented a normal northeasterly course over the central valleys.

VIII.—Appeared over the west part of the Gulf of Saint Lawrence on the 16th, and by the morning of the 17th had advanced to the vicinity of New Orleans, La., with pressure below 29.90. By the evening report of the 17th the center had reached southeastern Georgia. During the 18th it passed to the south New England coast, with pressure below 29.50. The

morning of the 19th the centre occupied the Maine coast, with pressure below 29.10, and by the morning of the 20th it had passed north of the Gulf of Saint Lawrence. The passage of this low area was attended in the Southwest by heavy snow and sleet from the 15th to 18th. Low temperature, rain, and snow caused heavy losses on the cattle ranges of Oklahoma Territory and Texas from the 15th to 18th. On the 16th and 17th the snowfall in central and southwestern Tennessee was 7 to 25 inches. On the 18th and 19th a heavy snowstorm prevailed over New York and New England, with southwest to northwest winds of 50 to over 60 miles per hour on the southeast New England coast.

IX.—Advanced from the Pacific Ocean and the morning of the 19th was central over or near Vancouver Island, with pressure below 29.70. Moving southeastward to the valley of the Columbia River during the 19th the center of disturbance passed thence to Alberta, and apparently dissipated on the northeast slope of the Rocky Mountains after the 21st, its passage from the north Pacific being unattended by noteworthy features.

X.—Appeared over the south part of the southern plateau region on the 20th, and the morning of the 21st was central near Fort Stanton, N. Mex., with pressure below 29.80. From that position it pursued a normal course to the Lake region by the 22d, and passed thence eastward to the Gulf of Saint Lawrence by the 24th, with lowest pressure, 29.60, over eastern Upper Michigan at the evening report of the 22d, on which date heavy snow and high winds prevailed over the north part of the Lake region. On the 22d the area of precipitation extended to the Atlantic coast, with snow in the lower lake region and northern New England, followed on the 23d by clearing weather in the middle Atlantic and New England states.

XI.—Apparently advanced from the Pacific coast north of Washington, and the evening of the 24th was central north of Montana, with pressure below 29.60. Passing to North Dakota during the 25th the center moved thence to the lower Missouri valley by the morning of the 26th, with pressure 29.40, where it was joined by a cyclonic area which appeared over Kansas the evening of the 25th. Moving eastward the center passed off the middle Atlantic coast during the 27th, and advanced thence eastward to a position south of Newfoundland by the morning of the 28th, with pressure below 29.40 on the 26th and 28th. On the 23d a trough of low pressure extended from the northeast slope of the Rocky Mountains over the southern

plateau region. In the evening, during a thunderstorm in the mountains east of Keeler, Cal., the wind reached a velocity of 51 miles per hour from the north at that station. On that date rain occurred on the Pacific coast and over the western plateau region north of the 40th parallel. On the 24th the wind reached a velocity of 56 miles per hour from the southwest at Tatoosh Island, Wash., and the rain area extended over the plateau region and Montana.

The evening of the 25th the pressure was low from Montana to the middle Gulf coast, with two cyclonic centers, one in the Red River of the North Valley and the other in southeastern Kansas. By the morning of the 26th the two centers had united over the lower Missouri valley, and the low area moved eastward with a display of marked energy. Severe local storms occurred in the Ohio and middle Mississippi valleys and Tennessee, and the rain area extended to the Atlantic coast states south of New England. Passing south of the Lake region the night of the 26–27th and the morning of the 27th the low area caused north to east gales over the southern lake region, heavy thunderstorms in the lower lake region, and rain from the middle Mississippi valley to the Atlantic coast from the Carolinas to south New England. During the 28th high northwest to north winds prevailed north of Hatteras, and rain was followed by clearing weather in the middle Atlantic states.

XII and XII a.—Was central off the Washington coast the morning of the 27th, with pressure 29.70. At the evening report of that date the pressure was low from the north Pacific coast to Arizona, with two cyclonic centers, one in the valley of the upper Columbia River and the other over the middle plateau region. By the morning of the 28th the centers had united over Montana, with pressure 29.50. On this date southeast to southwest gales of 50 to 60 miles per hour prevailed from the east part of the southern plateau region and northern Texas to the Dakotas, and the rain area extended from the Pacific coast over western Montana and the west part of the middle plateau region. During the 29th the center advanced to the Missouri valley, with pressure 29.50, south to west winds of 50 to 60 miles per hour occurred from the Dakotas to New Mexico, a velocity of 53 miles per hour from the southeast was noted at Chicago, Ill., and the rain area extended over the central valleys. During the 30th the center advanced to the southern extremity of Lake Michigan with a decrease of energy, fresh to high easterly winds prevailed over the lower lakes, and the rain area extended to the Virginia and Carolina coasts. During the 31st this low area dissipated over the Ohio Valley.

Tabulated statement showing principal characteristics of areas of high and low pressure.

Barometer.	First observed.			Last observed.		Duration.	Velocity per hour.	Maximum pressure change in 12 hours, maximum temperature change in 24 hours, and maximum wind velocity.									
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Station.	Rise.	Date.	Station.	Fall.	Date.	Station.	Direction.	Miles per hour.	Date.
High areas.		°	°	°	°	Days.	Miles.		Inch.			°					
I.....	1	49	83	50	63	1-5	25	Father Point, Quebec....	.44	1	Father Point, Quebec....	30	1	Montreal, Quebec.....	ne.	46	1
II.....	9	52	108	32	84	3-0	35	Bismarck, N. Dak.....	.70	9	Medicine Hat, N. W. T....	46	8	Corpus Christi, Tex.....	n.	46	10
III.....	12	54	105	52	97	1-5	13	Qu'Appelle, N. W. T.....	.58	11	Fort Assinaboine, Mont...	32	12	Fort Assinaboine, Mont...	se.	26	13
III a.....	14	53	105	28	86	5-5	19	Charleston, S. C.....	.36	19	Titusville, Fla.....	36	19	New Orleans, La.....	n.	34	18
IV.....	18	53	108	44	61	5-0	24	Saugeen, Ont.....	.50	20	Winnipeg, Man.....	28	19	Fort Assinaboine, Mont...	ne.	36	19
V.....	22	38	101	38	78	2-5	22	Pittsburg, Pa.....	.30	23	Abilene, Tex.....	24	22	Hatteras, N. C.....	n.	32	25
VI.....	25	42	125	41	89	6-0	27	Keokuk, Iowa.....	.48	27	Cleveland, Ohio.....	20	27	Cheyenne, Wyo.....	nw.	38	26
Mean.....						3-6	24		.48			31				37	
Low areas.									Fall.			Rise.					
I.....	1	39	75	47	58	6-0	14	Halifax, N. S.....	.38	3	Anticosti Island, G. of S. L.	20	3	Block Island, R. I.....	ne.	77	1
II.....	3	33	112	49	63	6-5	25	New York, N. Y.....	.44	8	Norfolk, Va.....	18	8	Corpus Christi, Tex.....	s.	38	5
III.....	6	53	112	47	87	1-5	33	White River, Ont.....	.34	7	White River, Ont.....	22	8	Helena, Mont.....	sw.	34	6
IV.....	7	51	112	47	87	2-0	26	Fort Assinaboine, Mont...	.54	8	Vicksburg, Miss.....	22	9	Bismarck, N. Dak.....	nw.	72	8
V.....	10	40	78	51	63	2-0	24	Quebec, Quebec.....	.56	11	Albany, N. Y.....	8	10	Woods Holl, Mass.....	sw.	67	11
VI.....	10	52	112	45	82	1-5	43	Edmonton, N. W. T.....	.72	9	Qu'Appelle, N. W. T.....	42	11	do.....	sw.	52	12
VII.....	14	31	106	27	91	1-0	42	San Antonio, Tex.....	.20	14	El Paso, Tex.....	12	14	El Paso, Tex.....	w.	28	14
VIII.....	16	26	93	51	66	3-5	30	Eastport, Me.....	.74	19	Hatteras, N. C.....	20	18	Woods Holl, Mass.....	sw.	64	19
IX.....	19	50	125	50	110	2-5	17	Calgary, N. W. T.....	.42	20	Bismarck, N. Dak.....	24	21	Salt Lake City, Utah.....	w.	36	19
X.....	21	34	105	47	66	3-0	35	Green Bay, Wis.....	.54	22	White River, Ont.....	34	22	Alpena, Mich.....	s.	43	22
XI.....	24	52	110	40	54	3-5	40	Kansas City, Mo.....	.34	26	Yankton, S. Dak.....	28	24	Tatoosh Island, Wash....	sw.	56	24
XII.....	27	46	125	41	85	4-0	25	Pierre, S. Dak.....	.46	28	Battleford, N. W. T.....	20	28	Huron, S. Dak.....	se.	60	28
XIII.....	29	52	117	38	100	2-0	26	Wichita, Kans.....	.36	31	El Paso, Tex.....	22	31	Amarillo, Tex.....	s.	60	28
Mean.....						3-0	29		.47			22				55	

XIII.—Advanced from the Pacific coast north of the 50th parallel and the morning of the 29th was central north of Washington, with pressure about 29.40. During the 29th and 30th the center moved eastward to the region north of Montana, with high winds over the plateau region to Arizona, and rain on the Pacific coast and over the middle plateau region. During the 31st the center moved southeastward along the eastern slope of the Rocky Mountains, and at the evening report of that date occupied west-central Kansas, with pressure below 29.30. Entering a region over which warm, moist air had been drawn by low area XII which dissipated over the Ohio Valley during the 31st, this low area acquired great energy. In western Texas and New Mexico the wind reached a velocity of 60 to 80 miles per hour on the 31st, and heavy gales and destructive tornadoes and local storms occurred in the evening in Nebraska, Kansas, Indian and Oklahoma Territories, Texas, Arkansas, Missouri, and Iowa.

The tornadoes in Nebraska and Kansas occurred within 300 miles, and generally southeast, of the storm-center. Those noted in Texas were distant nearly 600 miles, and nearly due south, from the center. The tornadoes in Nebraska and Kansas developed in an area running about 300 miles north and south and 200 miles east and west, and occurred between the hours of 5 p. m. and 10 p. m., 75th meridian time. They apparently originated first in the north part of the area between 5 p. m. and 6 p. m., in the south part from 7 p. m. to 8 p. m., and in the east part from 9 p. m. to 10 p. m., 75th meridian time. Those in central Texas appeared about 8 p. m., 75th meridian time. The isobars, isotherms, and wind directions at 8 a. m. and 8 p. m., 75th meridian time, together with the location and direction of movement of the tornadoes are shown on Charts VI and VII.

NORTH ATLANTIC STORMS FOR MARCH, 1892 (pressure in inches and millimeters; wind-force by Beaufort scale).

The paths of storms that appeared over the west part of the north Atlantic Ocean during March, 1892, are shown on Chart I. These paths have been determined from reports of observations by shipmasters received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

In March there is usually an increase of pressure from the Azores over the British Isles, Iceland, and Greenland, the greatest increase occurring over mid-ocean north of the 50th parallel, where it is more than .15. Over the United States and Canada and the Atlantic Ocean between the 20th and 40th parallels the normal pressure is lower than for February, the decrease being most marked over the Canadian Maritime Provinces and along the New England coast, where it is more than .10.

The storms of March have an average velocity of 22 miles per hour, and an average of 1.7 storm traverses the ocean from coast to coast. The storms of this month usually pass from the Nova Scotia or New England coasts to the region northeast of the Grand Banks, where the principal track divides, one branch passing to Iceland and thence to the north coast of Norway. The other branch crosses the ocean to the region west of the British Isles where it divides, one class of storms passing over or north of Scotland, and the other over France or the Bay of Biscay to the Mediterranean Sea. A limited number of storms appear in the Gulf of Mexico and pass thence northeastward to Newfoundland.

In March, 1892, two storms traversed the ocean. One, low area II, advanced from the south Pacific coast over the southern and eastern districts of the United States, developed marked energy after crossing New England, and reached the Bay of Biscay on the 13th. The other, low areas IV and V, probably advanced from the north Pacific Ocean, crossed the United States, and passing thence over the lower Saint Lawrence valley and the Atlantic as a storm of marked strength reached the British Isles on the 15th.

The slow advance of low area I from the middle Atlantic coast to Newfoundland was attended by severe storms west of the 50th meridian during the first seven days of the month. After the 8th this storm disappeared north of the region of observation. From the 1st to the 6th the pressure was low from the Azores to the Bay of Biscay, and by the 7th a severe storm had apparently advanced from that region over the Bay of Biscay and Spain. Low pressure to the south and southwest caused unusually low temperature and frequent snow over the southern parts of the British Isles. In the second decade of the month 2 energetic low areas, numbers V and VII, advanced over the Canadian Maritime Provinces, one of which, number V, reached the British Isles on the 15th. Unsettled weather and heavy gales were experienced over mid-ocean from the 10th to 18th, and low pressure and stormy weather occurred

over the British Isles until the 19th. In the third decade of the month a severe storm, low areas XI and XI α , advanced from the middle Atlantic coast to the region northeast of the Banks of Newfoundland from the 27th to the 29th. This storm occupied mid-ocean until the close of the month. Over and near the British Isles the weather continued generally settled after the 18th.

OCEAN ICE.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for March during the last 11 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
March, 1882	42 30	50 00	March, 1882	46 30	46 00
March, 1883	41 46	49 48	March, 1883	48 40	43 03
March, 1884	41 20	54 06	March, 1884	45 00	40 15
March, 1885	40 55	49 04	March, 1885	45 57	43 15
March, 1886	40 20	49 02	March, 1886	47 20	44 40
March, 1887	41 00	49 07	March, 1887	45 31	42 56
March, 1888	42 30	50 37	March, 1888	47 23	46 56
March, 1889	44 20	53 00	March, 1889	44 20	53 00
March, 1890	41 01	50 54	March, 1890	46 40	39 50
March, 1891	42 25	50 30	March, 1891	49 00	43 44
March, 1892	43 58	48 15	March, 1892	43 58	48 15
Mean	42 00	50 24	Mean	46 24	44 43

The limits of the region within which icebergs or field ice were reported for March, 1892, are shown on Chart I by ruled shading.

The southernmost and easternmost ice reported, a small iceberg noted on the 27th in the position given in the table, was about 1° north and 3° to 4° west of the average southern and eastern limits of ice for March. The following reports of ice observed show that the quantity of ice noted near Newfoundland and the Grand Banks was largely deficient when compared with ice reported for March during the last 11 years: 1st, iceberg grounded 9 miles east-southeast from Cape Race Light station. 7th, string of field ice, 12 miles in length, east of Cape Race Light station. 11th, 2 bergs 3 miles east of Saint Johns. 22d, heavy pack ice between Pictou, N. S., and Souris, P. E. I. 23d, heavy ice reported in the Gulf of Saint Lawrence. 27th, N. 43° 58', W. 48° 15', a small iceberg.

OCEAN FOG.

The limits of fog belts west of the 40th meridian, as reported by shipmasters, are shown on Chart I by dotted shading. East of the 55th meridian fog was reported on 5 dates; between the 55th and 65th meridians on one date; and west of the 65th meridian on 3 dates. Compared with the corresponding month of the last 4 years the dates of occurrence of fog near the Grand Banks numbered 7 less than the average; between the